ing with the Nymphalidæ, sub-family *Satyrinæ*. In the butterflies, Dr. Scudder has been chiefly followed.

The family *Papilionidæ* supplies us with an illustration that the book is only written primarily for American students; for the *Papilioninæ* are distinguished by the black ground-colour, the tail, and the five-branched radius of the fore-wings; and the *Parnassiinæ* by the white tailless wings and four-branched radius, characters not universally exact, though amply sufficient to distinguish the North American forms.

A curious fact is noticed by Prof. Comstock with reference to the Garden Whites. He tells us that the native American species—*Pieris oleracea* and *Pontia protodice*—have both become greatly lessened in numbers by the increase of the imported European *Pieris rapæ*.

Another curious fact noticed by Prof. Comstock is that the dog-flea is the common flea of the United States, the true *Pulex irritans* being comparatively rare; while the importance of counter-checks in agricultural entomology is illustrated by the author's remark: "Nothing more wonderful has been accomplished in economic entomology than the subduing in California of the cottony-cushion scale by the introduction from Australia of a lady-bug, *Vedalia*, which feeds upon it."

We cordially commend Prof. Comstock's book to European, and especially to British, entomologists: for, although it is written mainly for American students, it contains much which entomologists of other nations will find both useful and instructive. W. F. K.

AGRICULTURE AND HORTICULTURE.

Agriculture, Practical and Scientific. By James Muir, M.R.A.C. Pp. 350. (London: Macmillan, 1895.)

Agriculture. By R. Hedger Wallace. (London and Edinburgh: W. and R. Chambers, 1895.)

The Horticulturist's Rule-Book. By L. H. Bailey. Third edition. (London and New York: Macmillan and Co., 1895.)

PROF. MUIR'S neat and presentable volume is the latest claimant upon the indulgence of the agricultural public, the number of readers—and what is more to the point, the number of students—amongst whom is undoubtedly steadily increasing. Commencing with a discussion of the plant, the author speedily falls back upon the soil as the staple of his discourse, though parenthetically he introduces a chapter on plant food in the soil. Then we get the inevitable section on the British geological formations, which has about as much relation to the living art of agriculture as a list of our kings and queens has to a true understanding of English history. Drainage, irrigation, and other processes for ameliorating the soil are next discussed, and then half a dozen chapters are devoted to the important subject of manures. Implements and machines are next briefly glanced at, and the remainder of the book is occupied by chapters on the chief crops of British agriculture. We believe that, well-worn as the theme is, there is still room for novelty in the treatment of agriculture as a book subject, but Prof. Muir does not appear to have hit upon it.

Live-stock constitute the backbone—the sheet-anchor—of British agriculture, and to omit all reference to this indispensable section of our greatest national industry in a book bearing the comprehensive title of the volume under notice, is a blemish upon the work. No one would ever infer from its name that the volume is silent upon the great subject of sheep husbandry, which has become so inextricably—and we may add so advantageously—interwoven with the arable farming of this country. Nor would any one expect, in a book on "Agriculture, Practical and Scientific," to find no allusion to the milk-pail and the cows that fill it, and no mention of the butter and cheese industries. The author recognises that agriculture embraces "the breeding, feeding, and management of all kinds of farm live-stock," but it is not till the reader begins perusing its pages, that he learns that the work "will not attempt to deal with" this part of the subject. In this matter, the author had nobody but himself to please, and all we venture to say is that the title of the volume should have fitted its contents. A work on "agriculture" that ignores live-stock might fairly be compared to a treatise on chemistry that made no mention of carbon.

The part of the work that is best done is that relating to crops, and had Prof. Muir chosen to confine himself to this branch of farming, he would not have acted unwisely. His skilful treatment of this section of the subject serves to revive the recollection of John Wilson's admirable work in the middle of the century. But the most important cropping of all—that of grass land—is inadequately treated, though it is abundantly evident, from the few pages allotted to this subject, that the author might usefully have given more space to it at the expense of one or two perfunctory chapters which would not have been missed. The processes of hay-making and ensilage are well described, yet here again the idea arises that the author felt he was approaching his limits, and the result is that he appears to exercise a restraint which we feel sure has operated to the disadvantage of the reader. A feature of the work that will be much appreciated is that it reproduces in a handy form many of the tabular statements that have from time to time been published in the *Journal* of the Royal Agricultural Society of England. Three dozen illustrations accompany the text, and those of seeds are particularly noteworthy for their fidelity.

Commending the book, then, for its trustworthy treatment of farm crops, we may notice one or two features that seem to call for criticism. The index is sometimes relied upon for the introduction of terms not given in the text. Thus, "nitrification" is indexed as dealt with at page 25, turning to which the reader finds the process described, but no name given to it, unless perchance the term "oxidation" is inadvertently used instead. Other similar cases occur. A highly important subject to farmers, the temperature of germination, is surely awarded scant treatment when it is dismissed in the brief paragraph: "The temperature most favourable to germination varies in the seeds of different plants." Such frequent recourse is made by the author to the work of Lawes and Gilbert, that it is regrettable he did not imitate the consistency with which they employ the term "nodules" to denote the outgrowths on the roots of papilionaceous plants. The repeated use of the word

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"tubercle" can only lead to confusion, especially now that, in connection with bovine and other tuberculosis, it is so frequently heard at agricultural gatherings. Several peculiarities in spelling, adhered to throughout the work, might in a new edition be brought into conformity with general usage: examples are afforded in *Telletia*, *Cecydomyia*, *Centorhynchus*, *Sitona*, *Chonopodium*, *Claviceps purpura*.

It is difficult to understand why the second of the volumes of which the titles head this notice has been prepared, unless it be to find favour with candidates in a certain specified examination, the syllabus of which, however, the author tells us, "has not been slavishly followed." The really valuable parts of the book have apparently been culled from the writings of five living agricultural authors whose names are mentioned in the preface, and who, if they turn over the pages of this compilation, can hardly fail to alight upon much that they have seen before. It is regrettable that the author did not cling to his guides throughout. He would not in that case have said of sainfoin: "In appearance the leaves resemble those of vetches, but the blossom is more like that of red clover." Apart from the worthlessness of such a statement as this, it cannot fail to raise a doubt as to whether the author has ever seen a field of sainfoin. Again, with reference to lucerne, we read: "Like sainfoin, it produces good crops for about ten years." Where, we would ask, is the district in which sainfoin stands for anything like this period? What is meant by the statement that "sainfoin is much harder than lucerne"? The germination of a seed is described as "the period parallel to the sucking of a young mammal"; and elsewhere we read, "nitrification goes on or acts more quickly under circumstances favourable for rapid growth, and in this respect is parallel to germination." Nothing, perhaps, indicates the character of the book more thoroughly than the page of illustrations entitled "Various Specimens of —— s Grass Seeds." We omit the name of the seedsman, who probably would be sorry to claim that a seed of rye-grass, for example, sold by him is different from all other rye-grass seed.

The 350 pages of the book are divided into no fewer than 70 chapters. *Inter alia* a treatise on chemistry is introduced, with figures of a spirit-lamp and test-tube. From a chapter on "Blossoms and their functions," we cull the following specimen of literary grace: "We are apt to look upon them merely as objects created to feast man's eye with their beauty, or his nose with their sweet scent." The language of the book is of an irritating style, which is constantly in evidence from the grammatical blunder at the close of the preface down to the final chapter, in which reference is made to what "the plant needs to live healthy." It is, however, only fair to add that, at the outset, the author writes: "It has been my endeavour to avoid errors."

The sub-title of Mr. L. H. Bailey's book—"A compendium of useful information for fruit-growers, truck-gardeners, florists, and others"—indicates its scope. In a score of chapters such subjects are dealt with as injurious insects, insecticides, plant diseases, fungicides, lawns, grafting, seeding, storing of fruits and vegetables, the weather, and many other matters of practical interest. It is stated in the preface: "The contents of the volume have been gleaned from many sources; and, whilst the compiler cannot assume the responsibility of the value of the many recipes and recommendations, he has exercised every care to select only those which he considers to be reliable." The result is a most valuable book, and though intended primarily for American readers, it will none the less constitute a useful reference manual for horticulturists in this country. We notice, with regard to potato disease, that it is recommended to spray the plants with Bordeaux mixture "upon the first indication of the blight." It would probably be better to follow the advice, recently published by the Irish Land Commission, to spray before the appearance of disease, and thus employ the application as a preventive rather than a remedial measure. It is when the reader meets with such a remark as the "marsh-marigold or so-called cowslip," that he must bear in mind the American origin of the book. There is probably no better work of its kind.

OUR BOOK SHELF.

Electrical Laboratory Notes and Forms. Arranged and prepared by Dr. J. A. Fleming, F.R.S. (London: The *Electrician* Printing and Publishing Co.)

It is now generally recognised that the best way to teach the rudiments of science is by the natural or kindergarten method, which aims at leading the young student to observe facts and phenomena for himself, and come to conclusions concerning them. The method is applied easily enough to very elementary practical work, and with the best results. In the case of elementary work in physics, all the student requires to be told is what to do, and he may be left to find the teaching of his results. For instance, it is only necessary to instruct him to find the weights of equal bulks of different liquids and solids, and the results of his experiments show him at once what relative density means. This principle of letting the results of experiments suggest conclusions is undoubtedly the right one for introductory courses of practical physics and chemistry; indeed, almost the only information that need be given to the students in the laboratory is how to set up their simple apparatus and what to do with it; nothing ought to be said about what they are going to prove, or the experiments lose their value of developing the faculties of acute observation and intelligent induction from the observed facts.

Advanced work in physics and chemistry offers difficulties to the extension of the scientific method of observation and induction. The time spent in the laboratories is far too short to enable students to rediscover the more intricate laws and relationships for themselves, however admirable the mental training of such researches may be; and if the instruments are all arranged so that it is only necessary to press a knob to make them act, and obtain a result, the value of the mechanical observations then made cannot be very great. The difficulty of applying the scientific method to physical laboratory work is brought out by the volume before us. The volume contains twenty elementary and twenty advanced exercises in electrical measurement. Each exercise consists of a six-page sheet, two pages of which are occupied with a condensed account of the theoretical and practical instructions for performing the particular experiment, while the remaining pages are ruled up in lettered columns, to be filled in by the student with the results of his observations. What the student does

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